Massachusetts Bay Transportation Authority

MBTA CONTRACT NO. Y92PS05

DESIGN ENGINEERING SERVICES FOR REPAIR/REHABILITATION OF SYSTEM-WIDE TUNNELS (GREEN, BLUE & ORANGE LINES)

This MBTA Design Engineering Services for the Repair/Rehabilitation of MBTA System-wide Tunnels project will provide engineering services for the inspection and structural rehabilitation of the Green, Blue, and Orange Line tunnel structures. As part of the contract, services include an evaluation of groundwater levels and leak mitigation for the Orange Line tunnel in the vicinity of the Back Bay Station.

Design Team

GZA GeoEnvironmental, Inc. (GZA) is the prime consultant and is supported by Parsons Brinckerhoff; C&C Consulting Engineers, LLC; Green International Affiliates, Inc.; Dawn Underground Engineering, Inc.; and independent consultants Richard Pantaliere, Joseph Guertin, Martin Pierce, and Dino DiFronzo.

GZA GeoEnvironmental, Inc.

PARSONS BRINCKERHOFF

C&C CONSULTING ENGINEERS, LLC

Green International Affiliates, Inc.

Tunnel Inspections

The GZA team has completed the inspection of the Orange Line tunnel from Massachusetts Avenue Station to the Charlestown Portal and is presently preparing preliminary design documents for structural repair and leak sealing. Tunnel inspection was also completed in the Green Line tunnel from North Station to the Western Portals and for the Blue Line tunnel.

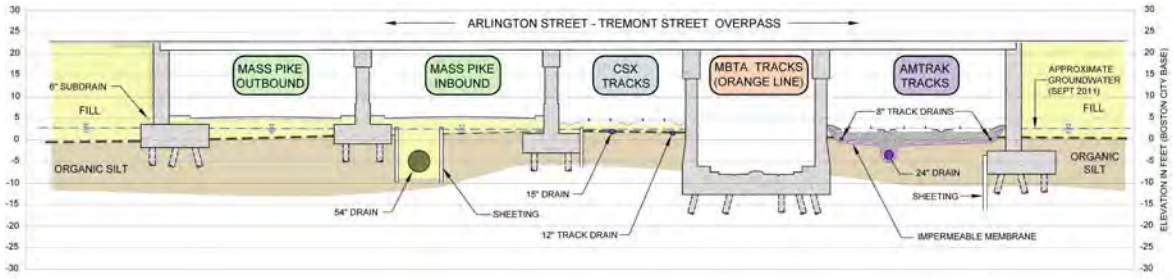
Groundwater

Prior to issuing the current contract, the MBTA had partnered with the City of Boston, Massachusetts Department of Transportation, Boston Water & Sewer Commission, Executive Office of Energy and Environmental Affairs, Department of Conservation & Recreation, Massachusetts Water Resources Authority, and the Boston Groundwater Trust (collectively known as the City/State Groundwater

Working Group) to develop a Short-Term Groundwater Action Plan that included installation of recharge wells in the Back Bay Station area. Under the Short-Term Groundwater Action Plan, three recharge wells were installed. Today, there are a total of five recharge wells that are currently active and pumping in the Back Bay Station area. The recharge wells are located on Cazenove Street, St. Charles Street, and Berkeley Street.

Long-Term Groundwater Action Plan

The GZA team is performing engineering analyses and developing data to formulate a Long-Term Groundwater Action Plan. Initial work has involved: reviewing existing information provided by the MBTA pertaining to construction of the various rail line structures in the vicinity of Back Bay Station with emphasis on drainage features of the MBTA Orange Line, CSX, and Amtrak lines; reviewing data from the existing recharge wells and working closely with the agencies noted above to obtain additional information on other drainage features in the Back Bay Station area; meeting with the designers of the Short-Term Groundwater Action Plan; and performing various field tests. These tasks are providing the information necessary to create a groundwater model. The groundwater model will be used to simulate groundwater elevations in the Back Bay Station area with emphasis on the Ellis neighborhood area under a variety of recharge schemes.



Tasks Completed and On-going

Tasks completed to date include: obtaining measurements of flow from the various pump stations within and around the railroad and subway tracks (Follen Street, Herald Street, South Cove, and the Massachusetts Turnpike); reviewing groundwater level data from the network of wells routinely collected by the Boston Groundwater Trust; repairing non-functioning piezometers previously installed by others in the study area; installing additional wells to supplement data from the Boston Groundwater Trust network; performing a walk-through of the 54-inch diameter storm drain pipe below the Massachusetts Turnpike; conducting elevation surveys; obtaining information on residential building sump pit and underdrain systems; constructing a preliminary groundwater flow model; and meeting quarterly with the City/State Groundwater Working Group.

Tasks Pending

Tasks we anticipate completing include: field testing of the existing recharge wells and a pump test at the Herald Street Pump Station. The field and pump tests will provide data to evaluate the hydraulic response in the monitoring wells, which will be used to calibrate the groundwater model. The product of our work will be to develop a Long-Term Groundwater Action Plan. The Long-Term plan will, to the extent practical, rely on stormwater for recharge; rather than the current use of potable water. We will also review the feasibility and cost effectiveness of installing impermeable cut-off walls to maintain the

water table at elevation 5.0 (Boston City Base datum). The Long-Term Groundwater Action Plan will identify: construction costs; yearly operational and maintenance costs; and permitting issues to implement the proposed Long-Term plan. The proposed Long-Term Groundwater Action Plan will be re-evaluated after the leak repair work is completed in the Orange Line tunnel structure to allow the effects of the repairs to be reviewed relative to the proposed recharge scheme.

Many of the ongoing field tasks require permits to allow the GZA team access onto the three track right-of-ways. Assuming that the various pending permits are granted and the necessary field tests are completed within the next 6 months, the concept design report associated with the Long-Term Groundwater Action Plan will be available by late fall 2012/winter 2013.